Claims

1. An apparatus for routing or switching data packets, including a router; and

an expanded M-trie data structure, said data structure having a set of nodes, including a root node, inferior nodes and terminal nodes, wherein each node includes an address and an opcode.

2. An apparatus as in claim 1, wherein said data structure includes a means for performing a lookup based on data included in a data packet.

3. An apparatus as in claim 1, wherein said data structure includes a means for performing a lookup of data included in a packet header.

4. An apparatus as in claim 1, wherein said data structure includes a means for performing a lookup of data included in an IP packet header.

5. An apparatus as in claim 1, wherein said opcode describes an operation to be performed based upon data included in a packet header so as to facillitate lookup of said packet header.

6. An apparatus as in claim 1, wherein said address includes the address of a said node in said expanded M-trie data structure that is to be traversed.

7. An apparatus as in claim 1, wherein said expanded M-trie data structure includes a set of access control parameters.

8. An apparatus as in claim 1, wherein said expanded M-trie data structure includes a set of QoS parameters.

9. An apparatus as in claim 1, wherein said expanded M-trie data structure includes a set of CoS parameters.

10. An apparatus as in claim 1, wherein said nodes include opcodes for demultiplexing, matching, hashing and other specialized instructions.

11. An apparatus as in claim 10 wherein said opcodes for demultiplexing include instructions to demultiplex into said M-trie plus branches based on the contents of one or more bytes included in a data packet.

12. An apparatus as in claim 10 wherein said opcodes for demultiplexing include instructions to demultiplex into said M-trie plus branches based on the contents of one or more bytes included in a packet header that that is being read.

13. An apparatus as in claim 10 wherein said opcodes for demultiplexing include instructions to demultiplex into said M-trie plus branches based on the contents of one or more bytes included in an IP packet header that that is being read.

14. An apparatus as in claim 10, wherein said opcodes for matching include instructions to compare the contents of a byte in the packet label to given node data.

15. An apparatus as in claim 10, wherein said opcodes for hashing include instructions to hash into different M-trie plus branches based on the contents of a byte in said packet header 122.

16. A method for routing or switching data packets, including steps of

receiving a data packet at an input interface on a router or switch;

looking up information in the header of said data packet in an expanded M-trie data structure;

terminating said lookup; and

routing said data packet at one or more output interfaces on said router or said switch.

17. A method as in claim 16, wherein said expanded M-trie data structure includes a root node, inferior nodes and a terminal node, each node including an address and an opcode.

18. A method as in claim 17, wherein said opcode describes an operation to be performed is based upon data included in a packet header, so as to facillitate lookup of said packet header.

19. A method as in claim 17, wherein said address includes the address of a said node in said expanded M-trie data structure that is to be traversed.

20. A method as in claim 16, wherein said expanded M-trie data structure includes a set of access control parameters.

21. A method as in claim 16, wherein said expanded M-trie data structure includes a set of QoS parameters.

22. A method as in claim 16, wherein said expanded M-trie data structure includes a set of CoS parameters.

23. A method as in claim 17 wherein said nodes include opcodes for demultiplexing, matching, hashing and other specialized instructions.

24. An apparatus as in claim 23 wherein said opcodes for demultiplexing include instructions to demultiplex into said M-trie plus branches based on the contents of a byte of said packet header that is being read.

25. A method as in claim 23, wherein said opcodes for matching include instructions to compare the contents of a given byte of the packet label to given node data.

26. A method as in claim 23, wherein said opcodes for hashing include instructions to hash into different M-trie plus branches based on the contents of a given byte in said packet header 122.